PROPOSED WIND FARM

AT TIRAWLEY, CO. MAYO

BIODIVERSITY ENHANCEMENT

AND MANAGEMENT PLAN

APRIL 2026

Prepared for

Constant Energy Ltd.

by

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1.0 INTRODUCTION

1.1 Background

This Biodiversity Enhancement and Management Plan (BEMP) has been prepared in support of the Environmental Impact Assessment Report (EIAR) produced for the proposed Tirawley Wind Farm, Co. Mayo. Full details of the Proposed Development are given in Chapter 2 of the EIAR.

As part of the Proposed Development, an area of blanket bog, measuring approximately 0.68 ha, will be built upon. As the blanket bog is considered of Local Importance (higher value), compensation is being provided to off-set the habitat loss through the implementation of a Biodiversity Enhancement and Management Plan (BEMP), as described in this report. In particular, the BEMP is focused on the preservation and enhancement of an area of blanket bog habitat (3.94 ha), which is within the boundary of an abandoned quarry at Castlelackan Demesne (the site for the BEMP). The BEMP will also provide mitigation for loss and disturbance to other habitats and species as a result of the Wind Farm Project.

Following the implementation of the measures outlined in this report, there will be a marked improvement in the quality/condition of a substantial mosaic of habitats at the BEMP site.

The enhancement and management programme described in this report will be implemented in accordance with published guidance and best practice, as follows:

- SNH (now NatureScot) “Planning for development: What to consider and include in Habitat Management Plan – Guidance” (Version 2, March 2016).
- Coillte (2008) *Restoring Active Blanket bog in Ireland* (LIFE Project Number LIFE02 NAT/IRL/8490). End of Project Report.
- Mackin *et al.* (2017) *Best practice in raised bog restoration in Ireland.* Irish Wildlife Manuals, No. 99. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Ireland.

A walk-over survey of the site was undertaken by Dr Brian Madden in June 2022 and again in February 2024 (when accompanied by Dr John Conaghan). Both are experienced ecologists with particular knowledge of peatland habitats, as well as a thorough familiarity with the ecology of north Co. Mayo.

Note: The BEMP area has a total of 14.24 ha and is essentially an abandoned commercial quarry. Part of this will be used for the permanent storage of surplus peat and spoil from the construction of the wind farm (see Figure 3). The predicted maximum area within the quarry required for storage is 2.71 ha (see **CEMP Management Plan 4: Peat and Spoil Management Plan**). When the deposited material settles, the area will be incorporated into the Plan area and managed for biodiversity.

Turbine no. AT16 is located within the quarry. The wind farm road, which leads to AT16 from the local public road, will continue northwards to connect to turbine AT15 (latter located in conifer plantation to north of quarry). AT16 and connecting road are not part of the BEMP area.

The BEMP will be implemented by the wind farm operator, with ecological expertise provided by an independent ecologist with experience in habitat and species management. All monitoring and progress reports prepared during the lifetime of the BEMP will be submitted to Mayo County Council.

1.2 Outline Description of Proposed Wind Farm Site

The Proposed Development is located approximately 5.2 km northwest of the village of Killala and approximately 4 km east-southeast of Ballycastle village in north Mayo. The Site, and especially the northern sector, is situated within a landscape which previously had been dominated by blanket bog and heath. Much of this has now been cut or converted to pasture grassland used for grazing cattle and sheep, with fields often small in size and bounded by hedgerows. Commercial coniferous forestry is a feature of the area.

The elevations within the Wind Farm Site range from approximately 20 m to 155 m OD. The highest elevations are in the north of the Site on the southern and eastern slopes of Knockboha Hill (peak of 186 m OD).

The bedrock geology underlying the Wind Farm Site is mapped predominantly as Dinantian Sandstones, Shales and Limestones of the Downpatrick Formation. The OSI Online Database indicates that Peat (Blanket Bog) is the primary soil type present across the site of the Wind Farm, which overlies Glacial Till derived from Sandstones and Limestones, with Alluvium in river valley bottoms. The majority of the peat covering the redline boundary area of the site is shallow with a depth of less than 0.5 m.

The majority of the Wind Farm Site is located in the Cloonalaghan_010 river sub-basin. The Cloonalaghan River flows in a northeast direction before discharging into Lackan Bay. The northeast of the Wind Farm Site is located in the Knockboha_010 river sub-basin.

Ecologically, the area in which the Wind Farm Site is located is dominated by agricultural grassland which varies from Improved agricultural grassland (GA1) to Wet grassland (GS4) depending on intensity of management. The fields are mostly bounded by Hedgerows (WL1), which are typically of a low stature. Drainage ditches (FW) are associated with most of the pasture fields. Conifer plantation (WD4) is a main habitat in the area and especially in the southwest sector. Intact Lowland blanket bog (PB3) is now scarce in the area of the Wind Farm, though some relatively intact blanket bog remnants, as well as Cutover bog (PB4), occurs in the northern (Lackanhill) and north-central sectors (Cloonanass-Lissadrone). Other habitats which occur over small areas are Broadleaved woodland (WD1), Scrub (WS1), Disturbed ground (ED), and Buildings and artificial surfaces (BL3).

From a wider conservation perspective, the Killala Bay system is the dominant feature of the local area. Much of the inner bay, including the Rathfran Bay inlet, is designated as an SAC and an SPA, as is Lackan Bay to the northwest of Killala Bay. Further to the west of the Wind Farm Site, extensive expanses of blanket bog become a feature of the landscape.

1.3 Objectives of the BEMP

Objectives - primary

To preserve and enhance an area of lowland blanket bog within an abandoned quarry facility, so as to compensate for the loss of blanket bog (at AT13 location) as a result of the proposed wind farm development.

Objectives - secondary

To preserve and enhance over time various other habitats and associated flora and fauna species of biodiversity value, so as to mitigate for loss of, and disturbance to, habitats and species affected by the wind farm development.

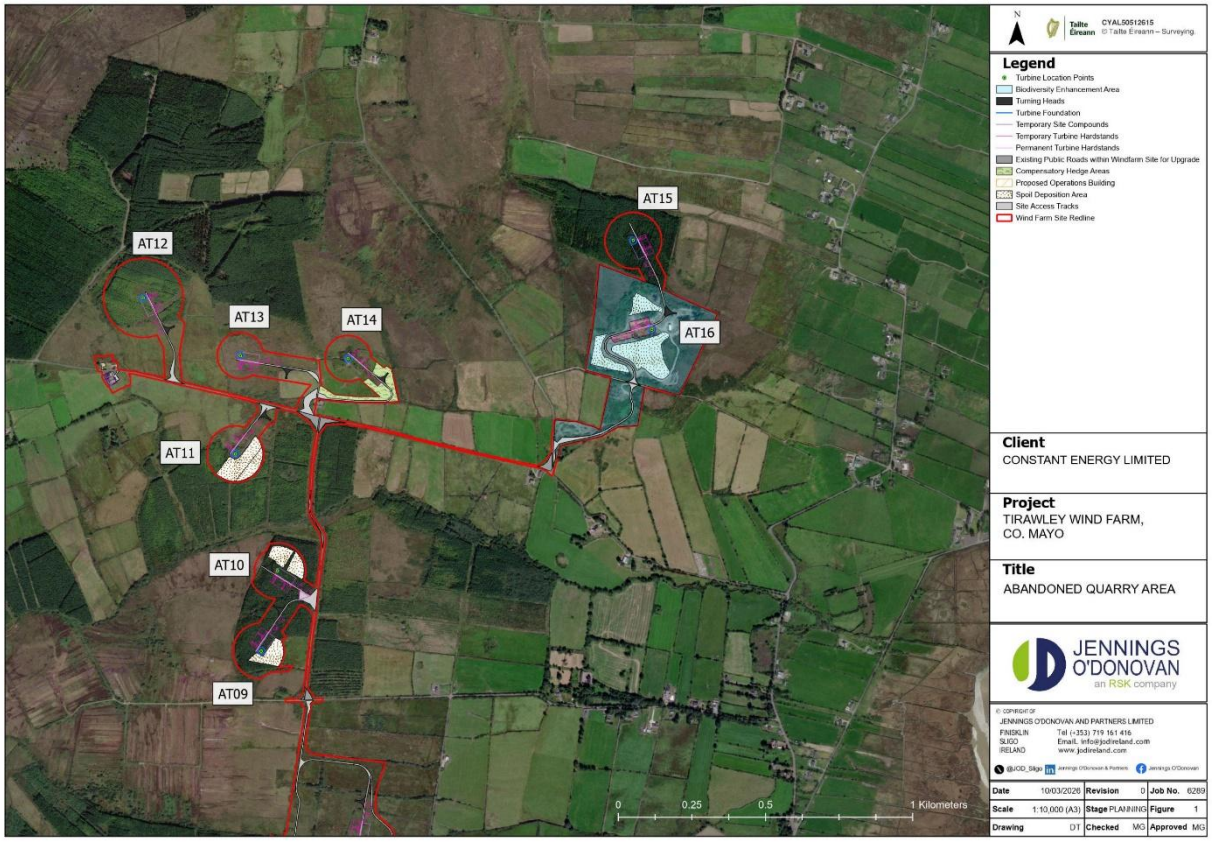

Figure 1. Location of abandoned quarry, i.e. BEMP area (shown in blue shading), at Castlelackan demesne in context of wind farm layout. Lackan Bay inlet is at bottom right of image.

2.0 PLAN DETAILS

2.1 Plan area location and physical description

The Plan area comprises much of an abandoned commercial quarry at Castlelackan demesne, which is within the north-eastern sector of the wind farm development area (see **Figure 1**). Access is easily available from the local road network.

The quarry is situated within a landscape dominated by gently sloping blanket bog, though much of this has now been converted to pasture grassland or planted with commercial forest. The site is within 1 km of the Lackan Bay coastal inlet, which is designated as an SAC and an SPA.

The quarry was in commercial production until approximately 2006. Since then, it has been abandoned and has been prone to illegal dumping.

Altitude of the quarry facility is from approximately 110 m to just over 120 m, with the quarried surface down to 94 m.

The solid geology of the site is mainly within the Mullaghmore Formation, which forms the uppermost rock sequence. Underlying this rock formation, the Downpatrick formation is exposed in the south part of the site, where the Mullaghmore Formation is absent.

The Mullaghmore Formation is described as: *A series of cyclical units of siltstones and shales which coarsen upwards into medium to coarse grained sandstones.*

The Downpatrick Formation is described as: *A sequence of interbedded sedimentary rock types comprising: near shore marine mudstones and siltstones; alluvial and deltaic sandstones and siltstones and fully marine bioclastic limestones interbedded with calcareous shales.*

2.2 Ecological description of Plan area

The quarry facility can be separated into the following principal habitats (see **Figure 2**):

- Recent quarried surfaces (ED4) - mosaic of bare rock / spoil heaps / recolonising bare ground
- Lowland blanket bog (PB3)
- Scrub (WS1) - tall and dominated by willow
- Scrub (WSI) - low and dominated by gorse and bramble
- Mosaic of low scrub (WS1) and meadow grassland (GS2)
- Mosaic of recolonizing bare ground (ED3) and meadow grassland (GS2)
- Artificial ponds (FL8)

Recent quarried surfaces (ED4)

The recent quarried surfaces comprise a mosaic of bare bedrock, loose rock and spoil heaps, which equates to the most recently worked areas of the facility. Much of this is still largely unvegetated,

while parts are in the early state of revegetation (see **Plates 1 & 2**). The sparse vegetation includes such species as narrow-leaved plantain *Plantago lanceolata*, daisy *Bellis perennis*, red clover *Trifolium pratense*, glaucous sedge *Carex flacca*, colt's foot *Tussilago farfara*, self heal *Prunella vulgaris*, fairy flax *Linum catharticum*, oxeye daisy *Leucanthemum vulgare*, bird's-foot trefoil *Lotus corniculatus*, creeping buttercup *Ranunculus acris* and rosebay willowherb *Chamerion angustifolium.* In places, heath species such as bell heather *Erica cinerea*, ling *Calluna vulgaris* and milkwort *Polygala vulgaris* are colonising the gravel surfaces. The mosses *Brachythecium rutabulum, Calliergonella cuspidata, Hylocomium splendens* and *Pseudoscleropodium purum* are represented, as well as the lichen *Peltigera canina*.

Castlelackan quarry – Habitat map.

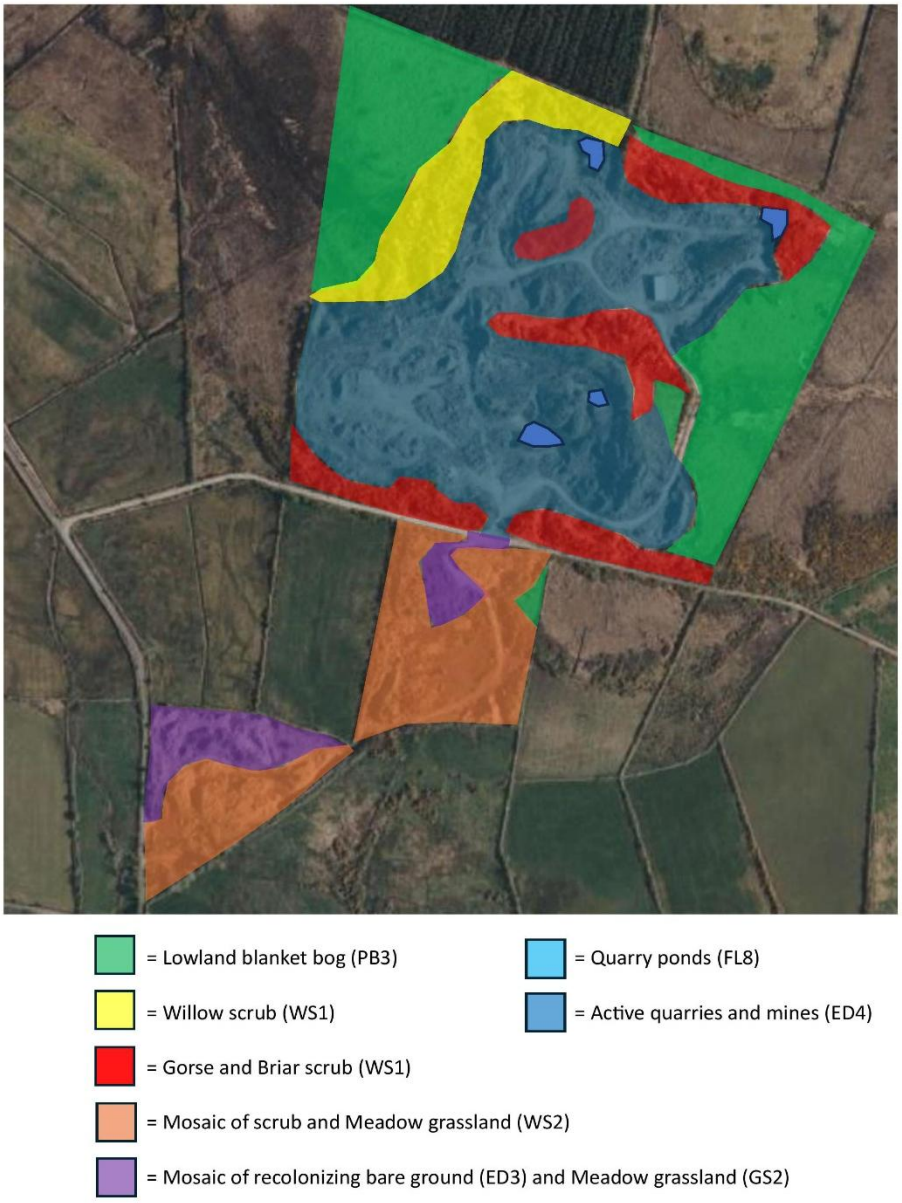

Figure 2. Aerial image of abandoned quarry at Castlelackan Demesne showing existing habitats.

Plate 1: View of recent quarried surfaces still dominated by largely bare rock (February 2024).

Plate 2: View of rock surfaces with sparse vegetation within the abandoned quarry at Castlelackan Demesne (February 2024).

Lowland blanket bog (PB3)

The quarry at Castlelackan Demesne was constructed in a fairly extensive area of blanket bog. Relatively intact blanket bog still remains within the Redline boundary in undisturbed areas along the eastern and north-western margins of the quarry complex (see **Figure 2** and **Plates 3 & 4**). Estimated area of bog within the BEMP site is 3.94 ha. Peat depth is likely to be up to 1.5 m and there is no evidence of recent cutting or excessive grazing. The strips which adjoin the former quarry works are disturbed, including from the tipping of spoil onto the bog.

The dominant species in the vegetation are ling *Calluna vulgaris,* hare's tail bog cotton *Eriophorum vaginatum,* purple moor-grass *Molinia caerulea* and deer grass *Trichophorum germanicum*. Other species present include cross-leaved heath *Erica tetralix,* bog cotton *Eriophorum angustifolium,* bog asphodel *Narthecium ossifragum,* carnation sedge *Carex panicea*, round leaved sundew *Drosera rotundifolia*, tormentil *Potentilla erecta*, and heath milkwort *Polygala vulgaris*. The bog mosses *Sphagnum capillifolium* and *S. papillosum* are frequent, as is the lichen *Cladonia portentosa*

Overall, the vegetation present is dominated by peat-forming species indicative of active blanket bog growth.

Plate 3. View of blanket bog along eastern margin of abandoned quarry at Castlelackan Demesne, (December 2023).

Plate 4. View of blanket bog in northeast sector of quarry facility, looking north-northeast. Some disturbance has been caused to bog close to the quarry road (February 2024).

Scrub (WS1)

An area of tall willow scrub occurs within the northwestern sector of the quarry (see **Figure 2** and **Plate 5**). This is up to 5 m in height and very much dominated by grey willow *Salix cinerea* subsp. *oleifolia* and eared willow *Salix aurita.*

Common gorse *Ulex europaeus* and bramble *Rubus fruticosus* dominated scrub is also represented as scattered stands throughout the quarry complex. In the southern sector of the BEMP site, scrub occurs in mosaic with meadow grassland.

Mosaic of recolonizing bare ground (ED3) and meadow grassland (GS2)

A low vegetation sward of recolonizing surfaces and meadow grassland occurs in the southernmost sector of the BEMP site.

Plate 5. Tall scrub dominated by Willow occurs in the western sector of the abandoned quarry, (December 2023).

Artificial ponds (PB3)

A number of small ponds have developed within the abandoned quarry (see **Figure 6.2** & **Plate 6**). The ponds contain deep water, i.e. >2 metres deep, and have rocky margins and bottoms. These ponds probably have been created in the last few decades as a result of quarry excavations and thus the associated aquatic vegetation is species-poor. In the shallow water along the pond margins *Agrostis stolonifera, Juncus articulatus* and *Ranunculus flammula* are common growing on a thin mineral soil however true aquatic species are rare in the deep water areas of the ponds. In the two northern ponds there is some limited development of swamp vegetation along the margins dominated by bulrush *Typha latifolia*. The ponds provide useful habitat for amphibians.

Plate 6. View of a pond in northeast sector of abandoned quarry. Some marginal swamp vegetation is developing (top right in picture), (February 2024).

2.3 Proposed Management Methodology

The following management measures outline the work that will be required for implementation of the Plan and will be in effect for the lifetime of the project.

Prior to the measures for the BEMP being implemented, AT16 and the associated road (outside of BEMP area) will have been constructed. The sectors of the quarry which will receive spoil will have been prepared by the Contractor accordingly (following details as described in EIAR). The areas to receive spoil are shown in **Figure 2.5** of **EIAR** (and see **Figure 3** below).

Prior to this, an ecologist will have carried out a pre-construction survey for the presence of amphibians within the ponds in the southern sector of the site (northern two ponds are not in areas to receive spoil or road excavations) and any other temporarily flooded areas of the quarry floor. Should any spawn or young/adult frogs or newts be found, these will be removed (under licence) to one of the other ponds within the facility.

The construction works required to prepared the ground for spoil deposition will be carried out outside of the bird breeding season (March-August). If there is a need for construction works during the restricted season, these will only occur after a pre-construction survey to ensure breeding birds will not be disturbed by works. It is noted that once the preparatory work has been complete, the deposition of spoil would not have effects on local breeding birds.

At the commencement of the above-mentioned construction works, all discarded metal and other materials associated with former quarrying activity, as well as materials dumped since (un-authorised), will be removed from the quarry facility for recycling or authorised disposal.

The filling of the cells with peat and mineral soil (latter may at times be partly mixed with peat) will be supervised, as required, by the ECoW. When deposition is complete, the material in the cells will be covered with topsoil and/or peat and allowed to settle. Measures will then be implemented to maximise the ecological value of these areas in the context of the overall BEMP area (see Measure no. 5 below).

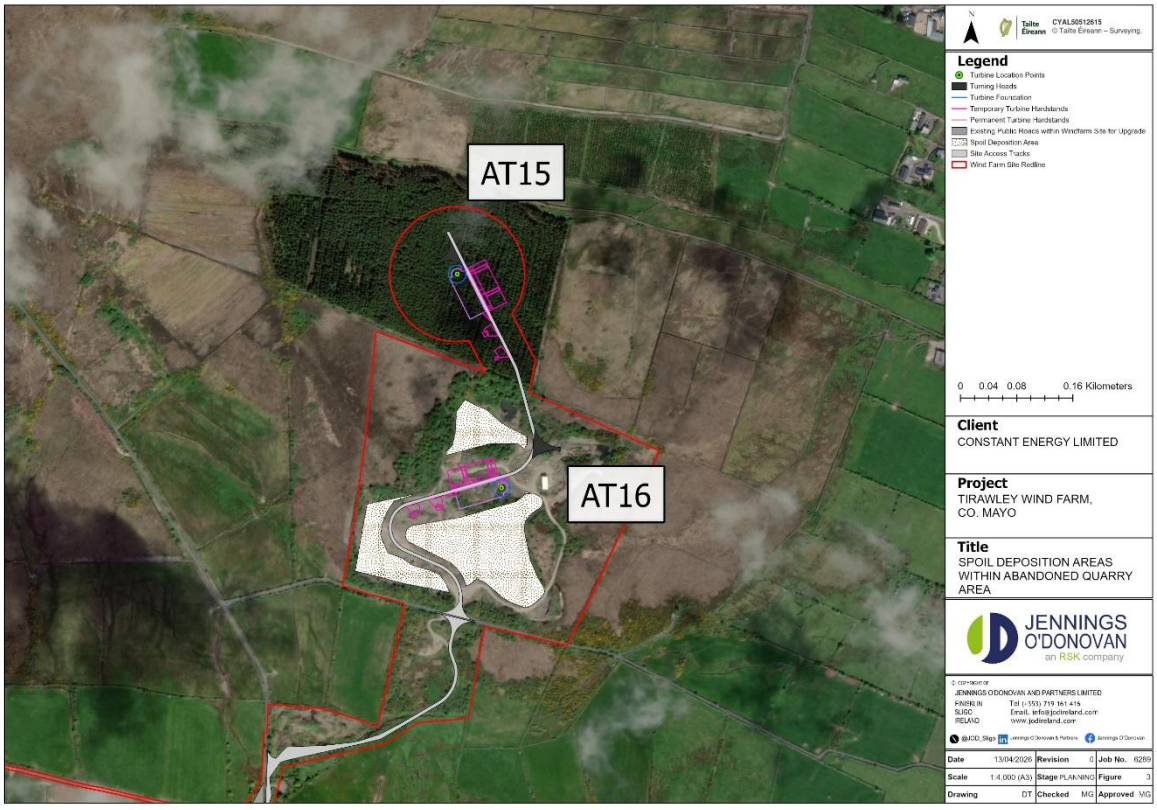

Figure 3. Areas within the abandoned quarry which are available to receive spoil from the construction works.

2.3.1 Measure no. 1: Baseline ecological resurvey of BEMP area

Once the construction of AT16 and the access road through the site (leading to AT15) is complete, and the storage facilities prepared and receiving spoil, a general baseline ecological survey of the site will be undertaken to establish conditions at start of Plan period. This will include the following (all surveys will be undertaken by personnel with appropriate expertise):

Habitat and flora survey - this will be in period May to September. Principal habitats will be mapped and species lists compiled. Notes will be made on areas of disturbance and where management works may be required. It is anticipated that an up-to-date aerial image will be compiled from a drone survey (and such would be repeated in future years).

Bird survey - this will comprise two site visits in summer and two in winter. A transect will be set up through the main habitats and will be used for future monitoring.

Bat survey - this will take place in period April to August when maximum bat activity can be expected. Three evening walk-over surveys will be undertaken to record activity throughout the site.

Amphibian survey - this will take place in period April to August when maximum amphibian activity can be expected within the ponds and wetlands on site.

Invertebrate survey - this will comprise at least two site visits during the summer period, with focus on butterflies, dragonflies and damselflies.

Any other wildlife species observed during the various surveys will be recorded, including mammal species such as the Irish hare (recorded in EIAR survey) and the common lizard (recorded in EIAR survey).

2.3.2 Measure no. 2: Demarcation of BEMP area

While the extent of the abandoned quarry facility is fairly clear, there is a need to identify the eastern and western boundaries, which are presently unmarked (though old fence lines may exist), so that third parties are aware of the area within the control of the Tirawley Wind Farm Project. This would be done by insertion of wooden posts within the bog at intervals along these boundaries. As disturbance to the bog needs to be minimised, the posts will be inserted by a ground team on foot, i.e. the posts will be hammered in by operatives without the need for bringing machinery onto the peat surface.

Should it be ascertained that grazers (sheep and/or cattle) are likely to enter the site from the adjoining bog, a sheep fence will be installed. If tracking machinery is needed to erect this, a row of bog mats will be installed to minimum disturbance to the bog.

2.3.3 Measure no. 3: Lowland blanket bog

As already noted, the blanket bog within the BEMP area is of considerable importance and will be preserved, without any future disturbance, for the lifetime of the project.

The survey for the EIAR concluded that the bog areas were relatively intact. However, the following potential issues requiring work are noted:

Physical disturbance

There is an obvious strip of disturbance where the bog adjoins the worked quarry areas, including patches where spoil had been spilled onto the bog vegetation - light scrapping back of such may be desirable, unless revegetation has occurred to such an extent that it would be better to avoid fresh disturbance (such will be established from the baseline survey).

Drains

The baseline survey to be carried out (see Measure 1) will identify if any former drains within the bog need to be blocked. If so, these will be assessed by a hydrologist to ensure that blocking same would not have any indirect impacts. Blocking of drains would normally be done by an excavator using peat (to form a plug) from adjacent (already disturbed) areas. In the case of smaller drains, plastic dams, inserted by hand could be used (see example in **Plate 7**).

The ultimate purpose of blocking drains is to raise water levels in the peat to encourage the growth of peat-forming vegetation and especially the growth of Sphagnum mosses.

If there are areas where there are no obvious drains but water is seeping out from the peat, it may be possible to install low peat bunds using an excavator. These peat bunds are essentially low ridges of excavated peat which slows the flow of surface water. This in turn will increase surface wetness in disturbed areas thus facilitating the growth of Sphagnum on the bog surface.

Procedures for drain blocking and bunding in bogs are described in detail in Mackin *et al*. (2017).

Self-seeded conifers and spread of scrub

Self-seeded conifers derived from commercial plantations are a threat to blanket bog habitats. The plantation to the northwest of the BEMP site was planted in the late 1990s and is reaching maturity and thus is a source of seed. Any self-seeded trees within the bog habitat will be plucked out by hand if small or marked for later removal if large.

Also, the potential spread of gorse and/or willow onto the drier margins of the bog will be monitored and control measures will be taken should this become an apparent problem. Measures would include cutting of scrub to the base and dapping the cut stumps with an environmentally sensitive herbicide.

Plate 7. An example of a recycled plastic dam used to block functioning drains on a raised bog site.

2.3.4 Measure no. 4: Other habitats

It is unlikely that the other habitats within the site, such as grassland on gravel surfaces and spoil heaps (from former quarry activities), scrub and ponds, will require active management.

2.3.5 Measure no. 5: Deposited peat and mineral soil

Once the deposition of spoil is complete, the deposited material will be covered with either a layer of topsoil or peat or a topsoil/peat mix. This will be derived locally from the sidecast material within the wind farm. It is expected that the material will take several months to dry out and stabilise.

It is proposed that the cells will be treated as follows (it is noted that fertilisers to promote growth will not be applied to any of the cells at any stage):

Cell(s) with peat deposit

If left to re-vegetation naturally, rushes will invariably become dominant throughout over a period of 1-2 years. A higher biodiversity value would be achieved by planting parts of the peat surface with trees and shrubs adapted to bog, chiefly willows (*Salix cinerea, S. aurita* & *S. purpurea*), birch *Betula pubescens* and possibly alder *Alnus glutinosa*. These would be sourced locally. Planting would best be done in clumps throughout the cell rather than continuous cover. It is noted that species such as willow, which has a good presence in the quarry, may naturally colonise the newly created surface.

Cell(s) with mineral soil deposit

The cells which are largely filled with mineral soil would best be used for meadow grassland, a habitat that has biodiversity value and is relatively scarce in the local area. The surface would be planted with a grass seed mix containing a native Irish wild flower component sourced in Ireland. Towards the end of the first full growing season (September - October) the sward would be mowed, with removal of cuttings. In the second year, a light spring mowing may be necessary and then a further autumn mowing. This management, i.e. sensitive mowing and with removal of cuttings, would then be repeated on an annual basis.

2.4 Monitoring

In order to confirm that the objectives of the Biodiversity and Enhancement Plan are being achieved, monitoring will be carried out during the lifetime of the wind project. SNH (2016) note that a Habitat Management Plan should be a live document, which may be altered following monitoring results, unexpected events or evolving guidance. Any proposed alterations would only occur following approval by the planning authority.

2.4.1 Monitoring for habitats

For habitat distribution within the plan area, it is proposed that monitoring will comprise a repeat of the general ecological survey of site (as described in Measure 1 above), including specific monitoring using quadrats where proactive work has taken place within the blanket bog area and where meadow grassland has been planted on the deposition cells.

The general walkover survey to describe habitats and species distribution would take place in Years 1, 2, 3 and 5 following the implementation of the Plan, with Year 1 being the base year at the time the works are carried out. After Year 5, a review of the progress of the Plan, in light of the objectives, will be conducted by the relevant parties (wind farm operator and independent ecologist). A programme will be developed for the next 5-Year period of the Plan (and so on for the lifetime of the project), which will be agreed with the relevant planning authority. Subsequent monitoring is likely to be at a lower frequency than in Years 1-5.

Where permanent quadrats are set up in the bog and grassland habitats, these would be monitored at the same frequency. The purpose of the quadrats is to monitor in detail vegetation changes over time. The location of these quadrats will be marked clearly using wooden pegs and the grid reference will be recorded using GPS. The occurrence and cover of vascular plant and moss species will be recorded in these quadrats according to the Zurich-Montpellier approach (Mueller-Dombois and Ellenberg, 1974). Various important parameters will also be recorded, including height of vegetation, cover of bare peat/soil, and degree of grazing and poaching (if any). This survey will take place in the late summer period of each monitoring year. Photographs of the quadrats will also be taken on deployment and subsequently during the following years of monitoring.

During the site visits for habitat monitoring of bog, a walk-over survey will take place in order to check for the presence of self-seeded conifers that may become established (as required in Measure 3). Seedings up to approximately 20 cm in height can be easily plucked out by hand, while larger saplings may need to be removed by loppers or hand-saw at some stage later in the year.

The walk-over survey will also observe if any further drains require blocking or if any of the newly installed dams (if used) require maintenance.

2.4.2 Monitoring for fauna

As it is expected that the diversity of bird species will increase as the Plan progresses, the breeding and wintering birds will be monitored. This will be done using the same quadrat as used in the initial baseline survey (Measure 1), though a deviation may be needed to include the re-vegetating deposition areas.

Bats and amphibians will also be included within the monitoring, following standard methods as used in the initial baseline survey.

The monitoring for fauna will be undertaken in Years 1, 2, 3 & 5, with a review after Year 5 (as with the habitat monitoring).

2.5 Time Period for Plan Implementation

It is expected that Year 1 of the Plan will coincide with the completion of wind farm construction works. The baseline surveys (Measure 1) and the subsequent physical works required (as described in section 2.3) will be implemented in Year 1, subject to settling of the deposited spoil and appropriate seasonality for surveys.

Year 2 and subsequent years of the Plan will be at approximately 12 months intervals after Year 1. It is preferable that the various monitoring is carried out at similar times in each monitoring Year. Tasks such as mowing of meadow grassland will be undertaken in each of the years (Measure 5).

3.0 OVERVIEW

The BEMP for the Tirawley Wind Farm project will preserve and enhance an area of lowland blanket bog (3.94 ha), which will provide compensation for the loss of blanket bog (0.68 ha at AT15 location) as a result of wind farm construction.

The BEMP will also preserve and enhance other habitats within the site (an abandoned quarry) and will develop additional habitats (meadow grassland and native woodland stands) on deposited peat and mineral soils derived from the wind farm construction.

Overall, it is anticipated that over time the biodiversity value of the site will increase substantially for habitats and associated flora and fauna species.

The Plan will be underwritten by a detailed monitoring programme, which will allow for modifications to ensure that the objectives are being achieved throughout the lifetime of the proposed wind farm. A reporting schedule will be agreed with the Planning Authority as evidence of compliance. All biological records collated from this monitoring programme will be shared with the National Biodiversity Data Centre (NBDC) and the Botanical Society of Britain and Ireland (BSBI) on completion of reports.

4.0 REFERENCES

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